

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Applicants: Petra SPECHT, Eicke R. WEBER,
Todd Russell WEATHERFORD

Case: UCB-3/CIP(B99-025-3)

Serial No.:

Filed:

Group Art Unit:

Confirmation No.:

Examiner:

Title: DOPING-ASSISTED DEFECT CONTROL IN COMPOUND
SEMICONDUCTORS

Mail Stop Patent Application
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

S I R:

DISCLOSURE STATEMENT

The applicants respectfully request that the following references be considered in the examination of the above-identified application. A copy of each reference is enclosed.

Publications

- AA. F.W. Smith et al, "New MBE Buffer Used to Eliminate Backgating in GaAs MESFET's", IEEE Electron Device Letters, Vol. 9, No. 2, 1988, pp. 77-80.
- AB. G.M. Metze et al, "Effects of Very Low Growth Rates on GaAs Grown by Molecular Beam Epitaxy at Low Substrate

- Temperatures", Applied Physics Letters, Vol. 42, No. 9, 1 May 1983, pp. 818-820.
- AC. S. Gupta et al, "Ultrafast Carrier Dynamics in III-V Semiconductors Grown by Molecular-Beam Epitaxy at Very Low Substrate Temperatures", IEEE Journal of Quantum Electronics, Vol. 28, No. 10, October 1992, pp. 2464-2472.
- AD. S. Gupta et al, "Subpicosecond Carrier Lifetime in GaAs Grown by Molecular Beam Epitaxy at Low Temperatures", Applied Physics Letters, Vol. 59, No. 25, 16 December 1991, pp. 3276-3278.
- AE. T.R. Weatherford et al, "Effects of Low-Temperature Buffer-Layer Thickness and Growth Temperature on the SEE Sensitivity of GaAs HIGFET Circuits", IEEE Transactions on Nuclear Science, Vol. 44, No. 6, December 1997, pp. 2298-2305.
- AF. D.C. Look, "On Compensation and Conductivity Models for Molecular-Beam-Epitaxial GaAs Grown at Low Temperature", Journal of Applied Physics, Vol. 70, No. 6, 15 September 1991, pp. 3148-3151.
- AG. M. Kaminska et al, "High Resistivity of Low Temperature MBE GaAs", Semi-Insulating III-V Materials, Proceedings of the 6th Conference on Semi-insulating III-V Materials, 13-16 May 1990, Toronto, Canada, pp. 111-116.
- AH. X. Liu et al, "Native Point Defects in Low-Temperature-Grown GaAs", Applied Physics Letters, Vol. 67, No. 2, 10 July 1995, pp. 279-281.
- AI. M. Luysberg et al, "Effects of the Growth Temperature and As/Ga Flux Ratio on the Incorporation of Excess As into Low-Temperature Grown GaAs", Journal of Applied Physics, Vol. 83, No. 1, 1 January 1998, pp. 561-566.

- AJ. Zuzanna Liliental-Weber, "TEM Study of the Structure of MBE GaAs Layers Grown at Low Temperature", Materials Research Society Symposium Proceedings, San Francisco, California, 16-19 April 1990, Vol. 198, pp. 371-376.
- AK. M.R. Melloch et al, "Formation of Arsenic Precipitates in GaAs Buffer Layers Grown by Molecular Beam Epitaxy at Low Substrate Temperatures", Applied Physics Letters, Vol. 57, No. 15, 8 October 1990, pp. 1531-1533.
- AL. X. Liu et al, "Mechanism Responsible for the Semi-Insulating Properties of Low-Temperature-Grown GaAs", Applied Physics Letters, Vol. 65, No. 23, 5 December 1994, pp. 3002-3004.
- AM. B.J. Lin et al, "Anomalies in MODFET's with a Low-Temperature Buffer", IEEE Transactions on Electron Devices, Vol. 37, No. 1, January 1990, pp. 46-50.
- AN. Z. Liliental-Weber et al, "Structural Properties of the GaAs Layers Grown by MBE at Low Temperatures", Semi-Insulating III-V Materials, Proceedings of the 8th Conference on Semi-insulating III-V Materials, 6-10 June 1994, Warsaw, Poland, pp. 305-317.
- AO. P. Specht et al, "Defect Control in As-Rich GaAs", Materials Science Forum, Proceedings of the 19th International Conference on Defects in Semiconductors, Aveiro, Portugal, July 1997, Vols. 258-263, pp. 951-956.
- AP. M.K. Weilmeier et al, "A New Optical Temperature Measurement Technique for Semiconductor Substrates in Molecular Beam Epitaxy", Canadian Journal of Physics, Vol. 69, 1991, pp. 422-426.
- AQ. U. Siegner et al, "Ultrafast High-Intensity Nonlinear Absorption Dynamics in Low-Temperature Grown Gallium

- Arsenide", Applied Physics Letters, Vol. 69, No. 17, 21 October 1996, pp. 2566-2568.
- AR. P. Grenier et al, "Subband Gap Carrier Dynamics in Low-Temperature-Grown GaAs", Applied Physics Letters, Vol. 70, No. 15, 14 April 1997, pp. 1998-2000.
- AS. T.S. Sonsnowski et al, "High-Carrier-Density Electron Dynamics in Low-Temperature-Grown GaAs" Applied Physics Letters, Vol. 70, No. 24, 16 June 1997, pp. 3245-3247.
- AT. M.R. Melloch et al, "Formation of Two-Dimensional Arsenic-Precipitate Arrays in GaAs", Applied Physics Letters, Vol. 61, No. 2, 13 July 1992, pp. 177-179.
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- AV. D.C. Look et al, "Anomalous Hall-Effect Results in Low-Temperature Molecular-Beam-Epitaxial GaAs: Hopping in a Dense *EL2*-Like Band", Physical Review B, Vol. 42, No. 6, 15 August 1990, pp. 3578-3581.
- AW. J. Gebauer et al, "Defect Identification in GaAs Grown at Low Temperatures by Positron Annihilation", Journal of Applied Physics, Vol. 87, No. 12, 15 June 2000, pp. 8368-8379.
- AX. E.R. Weber et al, "Identification of As_{Ga} Antisites in Plastically Deformed GaAs", Journal of Applied Physics, Vol. 53, No. 9, September 1982, pp. 6140-6143.
- AY. D.E. Bliss et al, "Annealing Characteristics of Low Temperature Grown GaAs:Be", Materials Research Society Symposium Proceedings, 4-6 December 1991, Boston, Massachusetts, Vol. 241, pp. 93-98.

- AZ. J. Gebauer et al, "Identification and Quantification of Defects in Highly Si-Doped GaAs by Positron Annihilation and Scanning Tunneling Microscopy" Physical Review Letters, Vol. 78, No. 17, 28 April 1997, pp. 3334-3337.
- BA. B.I. Shklovskii et al, "A General Description of Hopping Conduction in Lightly Doped Semiconductors" Chapter 4, Section 1, Electronic Properties of Doped Semiconductors, (© 1984, Springer-Verlag), pp. 74-82.
- BB. R.C. Lutz et al, "Thermal Stabilization of Non-Stoichiometric GaAs through Beryllium Doping", Materials Research Society Symposium Proceedings, 13-17 April 1998, San Francisco, California, Vol. 510, pp. 55-59.
- BC. S.M. Sze, Appendix H, Physics of Semiconductor Devices, 2nd ed., (© 1981, John Wiley & Sons, Inc.), pp. 850-851.
- BD. J. Kruger et al, "The Influence of Native Point Defects on the Performance of Diodes Built on Neutron-Irradiated Semi-Insulating GaAs", Semiconducting and Insulating Materials, Proceedings of the 9th Conference on Semiconducting and Insulating Materials (SIMC'9), 29 April-3 May 1996, Toulouse, France, pp. 345-348.
- BE. M.A. Zaidi et al, "Minority Carrier Capture Cross Section of the EL2 Defect in GaAs", Applied Physics Letters, Vol. 61, No. 20, 16 November 1992, pp. 2452-2454.
- BF. M. Oestreich et al, "Picosecond Spectroscopy of Plastically Deformed GaAs", Journal of Luminescence, Vol. 58, (© 1994, Elsevier Science B.V.), pp. 123-126.

- BG. A. Mitonneau et al, "Electron and Hole Capture Cross-Sections at Deep Centers in Gallium Arsenide", Revue de Physique Appliquee, Vol. 14, October 1979, pp. 853-861.
- BH. P. Specht et al, "A Standard Low Temperature GAAS Growth: Prerequisite for Defect Engineering", 4th Symposium on Non-Stoichiometric III-V Compounds, Pacific Grove, CA, October 2-4, 2002, pp. 31-36.
- BI. Sprecht et al, "Defect Control in As-Rich GaAs", Materials Science Forum, Vols. 258-263, Switzerland, 1997, pp. 951-956.
- BJ. Lutz et al, "Electrical Properties and Thermal Stability of Be-doped Non-stoichiometric GaAs", Semiconducting and Insulating Materials, 1998, Proceedings of the 10th Conference, Berkeley, CA, June 1, 1998-June 5, 1998, pp. 113-117.
- BK. Zhao et al, "Time-Resolved Reflectivity Measurement of Thermally Stabilized Low Temperature Grown GaAs Doped with Beryllium", Semiconducting and Insulating Materials, 1998, Proceedings of the 10th Conference, Berkeley, CA, June 1, 1998-June 5, 1998, pp. 130-133.
- BL. Maltez et al, "Structural and Photoluminescence Analysis of Er implanted LT-GaAs", Semiconducting and Insulating Materials, 1998, Proceedings of the 10th Conference, Berkeley, CA, June 1, 1998-June 5, 1998, pp. 122-125.
- BM. Luysberg et al, "Control of Stoichiometry Dependent Defects in Low Temperature GaAs", Semiconducting and Semi-Insulating Materials Conference, Toulouse, France, April 29, 1996 - May 3, 1996, pp. 21-26.

- BN. P. Specht et al, "Conductive Non-Stoichiometric III-V Compounds: Properties and Prospective Applications", Symposium on Non-Stoichiometric III-V Compounds, October 8th-10th 2001, Erlangen, Germany, pp. 1-6.
- BO. P. Specht et al, "Defect engineering in MBE grown GaAs-based materials", Int. Conf. SIMC-XI, Australia, 2000, 4 pages.


REMARKS

Under rule 37 C.F.R. 1.98(a) (effective March 16, 1992), since all of the above-cited references are in the English language, the applicants submit that no specific comments are necessary for any of these.

For the Examiner's convenience, the applicants have attached a completed modified Form PTO/SB/08B hereto.

Respectfully submitted,

November 12, 2003


Peter L. Michaelson, Attorney
Reg. No. 30,090
Customer No. 007265
(732) 530-6671

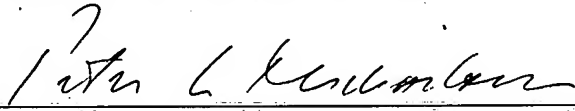
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Counselors at Law
Parkway 109 Office Center
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		First Named Inventor	Petra SPECHT
		Group Art Unit	
		Examiner Name	
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	AL. X.	Liu et al, "Mechanism Responsible for the Semi Insulating Properties of Low Temperature Grown GaAs", Applied Physics Letters, Vol. 65, No. 23, 5 December 1994, pp. 3002-3004.	
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